

REMARKS

In accordance with the foregoing, claim 1 is amended. No new matter is added. Claims 1-18 are pending and under consideration. Reconsideration is respectfully requested.

INTERVIEW WITH THE EXAMINER

Applicants wish to thank Examiner Liew for the courtesy of an interview granted to Applicant's representative on March 20 and 24, 2008, at which time the outstanding issues in this case were discussed. Arguments similar to the ones developed hereinafter were presented. In the Interview Summary posted on PAIR following the interview, the Examiner indicated that amended claim 1 overcomes the current rejection. Further, in light of the arguments with regard to claim 2, the Examiner agrees that Ozeki fails to anticipate or render obvious that the "three-dimensional information acquiring unit receives a reflected light of a light projected by projecting unit onto said object by unit of light receiving unit to acquire three-dimensional information on an inclination of a surface on which said measuring point of said object exists and/or a distance from said camera to the surface."

CLAIM REJECTIONS UNDER 35 U.S.C. §103

Claim 1 was rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 5,129,010 to Higuchi (hereinafter "Higuchi"), in view of U.S. Publication No. 2002/0097906 to Ishiyama ("Ishiyama") and U.S. Patent No. 6,101,268 to Gilliland ("Gilliland").

Applicants acknowledge with appreciation that the Examiner accepted the arguments presented in the interview of October 4, 2007 and reiterated in the amendment filed in on October 19, 2007 that Higuchi and Ishiyama alone or in combination do not disclose all the features recited in claim 1. Claim 1 is amended herewith in light of the interview to clarify the claimed subject matter.

The outstanding Office Action invokes Gilliland as disclosing "a unit determining a straight line which passes through a measuring point on the object and a specific point on said camera from the image of the object captured by said camera" (see item 1 on page 2, section "Response to Applicant's Arguments, and page 4 lines 1-6 of the outstanding Office Action).

However, Applicants respectfully submit (A) Gilliland fails to provide the missing features and (B) Gilliland's teachings cannot be integrated in Higuchi's apparatus.

(A) Gilliland discloses a method and an apparatus for scanning an object **using at least two cameras** (16A and 16B, emphasis ours) to obtain data on the object and determine the configuration of the object which is then used to perform a welding, cutting or other operation on the object (see Gilliland's Abstract). The outstanding Office Action directs attention to FIG. 4B in which R1-1 and R1-2 are straight lines related to cameras 16A and 16B therein. Gilliland describes FIG. 4B as:

FIG. 4B illustrates one method of scanning the workpiece. The cameras 16A and 16B are aimed, via control of angles A1-1 and A2-1, respectively, to point along lines R1-1 and R2-1, respectively toward a first point P1. The ranging information from the cameras is then captured and stored. If a part of the workpiece is present it will lie at the intersection point P1 of lines R1-1 and R2-1. The camera angles necessary to view a second point P2 are then determined, where point P2 is separated from point P1 by some specified distance, $\Delta X1$. The camera angles are then changed to A1-2 and A2-2 to point along lines R1-2 and R2-2, which intersect at point P2. The camera angles necessary to view a third point P3 are then determined, where point P3 is separated from point P2 by some specified distance, $\Delta X2$. The camera angles are then changed to A1-3 and A2-3 to point along lines R1-3 and R2-3, which intersect at point P3. The separation distances $\Delta X1$ and $\Delta X2$ are preferably the same but may be different. This is repeated until the workpiece has been scanned along line L1. Then, new camera angles are determined to cause the cameras to view points (not shown) of the workpiece which are line L2, line L2 being separated from line L1 by some specified distance, $\Delta Y1$. Scanning is then performed along line L2, then along line L3, line L3 being separated from line L2 by some specified distance, $\Delta Y2$. The separation distances $\Delta Y1$ and $\Delta Y2$ are preferably the same but may be different. This is repeated until the workpiece has been scanned. The cameras are then moved to a different position, if necessary, to obtain information from a different observation point, such as the other end of the workpiece. (See Gilliland, col. 13, lines 16-43).

One cannot determine a three dimensional position using triangulation, unless two physically distinct cameras capture simultaneously images of the same point on the object. Claim 1 recites "a unit determining a straight line which passes through a measuring point on the object and a specific point on **said camera** from the image of the object captured by said camera" (emphasis ours, claim 1 does not recite more than one camera). In FIG. 4B Gilliland, pairs of straight lines (R1-1, R2-1), (R1-2, R2-2), (R1-3, R2-3) intersect in different points P1, P2, P3 of the object by changing angles of the cameras 16A and 16B. Gilliland does not teach or

suggest that these straight lines are **determined from the image of the object captured with one respective camera**. Since the straight lines are not determined from an image captured with one camera, they cannot be further used by the “unit determining a three-dimensional position of said measuring point **from the straight line determined by said unit for determining a straight line** and the surface determined by said unit for determining the surface” as recited in claim 1. In other words, the mere fact that straight lines are used when viewing an object using two cameras in Gilliland does not anticipate the three dimensional sensor recited in claim 1, in which only one image from one camera is available and used.

(B) Gilliland’s teachings cannot be integrated in Higuchi’s apparatus. Lines 6-10 on page 4 of the outstanding Office Action assert:

One skilled in the art would include determining a straight line which passes through a measuring point on the object and a specific point on said camera from the image of the object because to use triangulation to find the location of the cameras in three dimensional space and determine the shape of the object, to improve recognition of the object.

Triangulation is a method of finding a location of an unknown point using a triangle having formed by two known points (the positions of the two cameras in Gilliland) and an unknown point (i.e., the point on the object). Triangulation is not usable for the sensor of claim 1 because there is only one camera. Thus the alleged reason to combine is not applicable, and Gilliland’s teachings cannot be combined with those of Higuchi.

In view of the above, Applicants respectfully submit that independent claim 1 patentably distinguishes over the cited prior art at least by reciting

- a unit determining **a straight line** which passes through a measuring point on the object and a specific point on said camera **from the image of the object captured by said camera**; and
- a unit **determining a three-dimensional position of said measuring point from the straight line** determined by said unit determining a straight line and the surface determined by said unit determining the surface (emphasis ours).

Claims 2-4 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,280,542 to Ozeki (“Ozeki”), in view of U.S. Patent No. 5,917,940 to Okajima (“Okajima”) and official notice (MPEP 2144.03).

Ozeki discloses a method of measuring XYZ coordinates of an object by projecting pulse slit light onto the object, capturing an image of the slit line formed on a surface of the object using a TV camera, and processing the image from the camera to determine the position of the slit line on the camera based on comparing a weighted average of the intensity values of the slit line with tabled values (see Ozeki's Abstract). The Office Action alleges that the two-dimensional information acquiring unit recited in claim 2 is anticipated by the TV camera 14 in FIG. 1 of Ozeki, and the three-dimensional information acquiring unit recited in claim 2 is anticipated by the slit line detecting circuit 22 in FIG. 1 of Ozeki. First, Applicants respectfully note that the slit line detecting circuit 22 does not acquire information but merely uses the video signal acquired by the camera 14 via the A/D converter 20. Second, Ozeki asserts that the "slit line detecting circuit 22 is detecting a video signal exceeding the threshold value determined by a threshold value setting circuit 24 and delivering the detected video signal as a slit line." Thus, the slit line detecting circuit 22 does not "receives a reflected light of a light projected by projecting unit onto said object by unit of light receiving unit to acquire three-dimensional information on an inclination of a surface on which said measuring point of said object exists and/or a distance from said camera to the surface" as recited in claim 2.

Therefore, Ozeki fails to teach or suggest the three-dimensional informational acquiring unit as recited in claim 2, which is contrary to the position asserted in the outstanding Office Action. Okajima does not correct or compensate for the above-identified failure of Ozeki to anticipate or render obvious all the features of independent claim 2.

Additionally, the Office Action submits that Ozeki and Okajima "do not discuss calibrating the video prior to imaging the object" but takes Official notice that "[one] skilled in the art would include calibrating sensor, camera or video prior to imaging an object or scene" (see lines 5-9 on page 7 of the outstanding Office Action).

Applicants respectfully argue again that, claim 2 actually recites that "said information combining unit **combines information** acquired by said two-dimensional information acquiring unit and information acquired by said three-dimensional information acquiring unit **based on calibration information of said camera** and generates new three-dimensional information" (emphasis ours). Claim 2 does not merely recites a calibration prior to usage as alleged in the Office Action, but that the information acquired by said two-dimensional information acquiring unit and the information acquired by said three-dimensional information acquiring unit is

combined based on calibration information. Thus, the calibration information is not a broad type of calibration information as alleged in the Advisory Action, but a type of information based on which the information acquired by said two-dimensional information acquiring unit and the information acquired by said three-dimensional information acquiring unit can be combined to yield **new three-dimensional information**.

Thus, independent claim 2 and claims 3-8, 15, and 16 depending from claim 2, patentably distinguish over Ozeki and Okajima alone or in combination at least by reciting:

- a three-dimensional information acquiring unit [...] [that] receives a reflected light of a light projected by projecting unit onto said object by unit of light receiving unit to acquire three-dimensional information on an inclination of a surface on which said measuring point of said object exists and/or a distance from said camera to the surface, and
- an information combining unit [...] [that] combines information acquired by said two-dimensional information acquiring unit and information acquired by said three-dimensional information acquiring unit based on calibration information of said camera and generates new three-dimensional information.

Claims 5-7 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ozeki in view of Okajima and further in view of U.S. Patent No. 5,307,419 to Tsujino ("Tsujino").

Claims 8-11 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ozeki in view of Okajima and further in view of Gilliland and U.S. Patent No. 5,699,444 to Palm ("Palm").

Claims 15 and 16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ozeki in view of Okajima and further in view of U.S. Patent No. 6,137,902 to Kinoshita ("Kinoshita").

Tsujino, Gilliland, Palm and Kinoshita do not correct or compensate for the above-identified failure of Ozeki and Okajima to render obvious all the features recited in independent claim 2. Therefore, claims 5-8, 15 and 16 are patentable at least by inheriting patentable features from independent claim 2.

The outstanding Office Action rejects independent claim 9 by only stating "see the rationale and rejection for claims 2 and 8. Applicants respectfully request the Examiner to comply with 37 C.F.R. 1.104(c)(2) which states:

In rejecting claims for want of novelty or for obviousness, the examiner must cite the best references at his or her command. When a reference is complex or shows or describes inventions other than that claimed by the applicant, the particular part relied on must be designated as nearly as practicable. The pertinence of each reference, if not apparent, must be clearly explained and each rejected claim specified.

The subject matter recited in claim 9 is not a sum of the features recited in claim 2 and 8. For example, claim 9 recites "a unit for determining an intersection between said straight line and said second surface" which has not equivalent in the previous claims.

Further, claims 12-14 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ozeki in view of Okajima, Gilliland and Palm, and further in view of Tsujino. Claims 17 and 18 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ozeki in view of Okajima, Gilliland, Palm and further in view of Kinoshita.

Independent claim 9 and claims 10-14, 17 and 18 depending directly or indirectly from claim 9, patentably distinguish over the cited prior art at least because none of the cited prior art references render obvious the following features recited in claim 9:

- a three-dimensional information acquiring unit that receives a reflected light of a light projected by projecting unit onto said object, by unit of light receiving unit, to acquire three-dimensional information on an inclination of a first surface which has a certain positional relationship with said measuring point on said object and/or a distance from said camera to the surface;
- an information combining unit that combines information acquired by said two-dimensional information acquiring unit and the three-dimensional information acquired by said three-dimensional information acquiring unit based on calibration information of said camera, and generates new three-dimensional information;
- a unit for determining a straight line in a three-dimensional space which passes through the measuring point on said object and a specific point on said camera;

- a unit for determining, from the information on said first surface, information on a virtual second surface which has a certain positional relationship with said first surface and passes through the measuring point on said object; and
- a unit for determining an intersection between said straight line and said second surface.

CONCLUSION

There being no further outstanding objections or rejections, the application is submitted as being in condition for allowance which action is earnestly solicited.

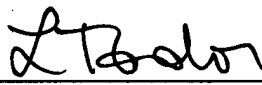
If the Examiner has any remaining issues to be addressed, it is believed that prosecution can be expedited by the Examiner contacting the undersigned attorney for a telephone interview to discuss resolution of such issues.

If there are any underpayments or overpayments of fees associated with the filing of this Amendment, please charge and/or credit the same to our Deposit Account No. 19-3935.

Respectfully submitted,

STAAS & HALSEY LLP

Date: April 28, 2008

By: 
Luminita A. Todor
Registration No. 57,639

1201 New York Avenue, N.W.
Suite 700
Washington, D.C. 20005
Telephone: (202) 434-1500
Facsimile: (202) 434-1501